Tingnal Jones #7

Dr. Barton
No. 20.

Ofc. of Blood - in
System

Operation of Medicines
on the
Animal System.

Tingnal Jones

1813

An Essay
on the
Operation of Medicines
on the
Animal System,
and
Several Physiological Points
with which
It is Connected.

Tingnal Jones - Virg.
Ex. 5 St March 10th 1813

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Preface.

Being fully impressed with a belief that the only bene-fits which result to the science of medicine from the dissertations of graduates in the different schools of me-dicine, arise from those, in which are communicated some new facts or principles, or an attempt to investigate some of the most obscure and difficult parts of that science, and not from an implicit sanction, or a compilation of the pre-vailing doctrines and improvements of different authors, I have carefully avoided the latter, and obeyed the dic-tates of duty by endeavouring to explore a new some of its most rugged and unknown parts; to this resolution I was not urged by any flattering prospects of success, but from an obligation which I think is enjoined on every candidate by that regulation of universities which requires of them an essay. Although I am conscious that my ef-forts will not lead me to a complete elucidation of

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the subject which I have chosen, yet I shall feel myself very amply rewarded if I point out an error of other adventurers, and only invite the attention of, and furnish one material for those whose talents and resources may enable them to burst asunder some obstacles, and dispel the dark clouds which hang over some parts of our science.

The object of this essay is to advance a few ideas on the operation of medicines on the animal system, and also the several points of physiology which it necessarily involves, not founded on any experiments and observations of my own, but suggested to me only in the course of my studies on some of the functions of the animal oeconomy, and by a knowledge of the properties and effects of a few classes of medicines, made known to me by different authors on the materia medica. This I acknowledge is a vague and incorrect method of attaining

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a truth in philosophical inquiries, yet from a few established principles assisted by reason and analogy, we may sometimes form theories which may point out a new course to future adventurers, and give rise to experiments, which may bring into view the causes of phenomena that otherwise would lie dormant for centuries. These are the views by which I have been prompted to form many visionary conjectures concerning the physiological points which have an immediate bearing to the principal subject. Though as many of the operations in nature, are so obscure as to admit of no experiments for their elucidation, we are compelled to frame our theories to meet the actual facts with which we are acquainted; and as originality has been my design in this I have given no restraint to my imagination on these subjects.

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doctrines taught in this institution, let me candidly avow that it arises not from a want of veneration and due respect towards their authors, but from that independence and freedom which has characterized all their opinions, and which I doubt not their liberality will grant me and every other tyro in medicine.

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It is necessary before I enter on the subject which is the principal design of this essay to make some preliminary observations on several physiological points which have so intimate and immediate a connection with the subject before me, that to dispense with them entirely would be as impracticable, as attempting to erect a fabric without first giving to it a strong foundation.

As the primary agent, and proximate cause of perfect animal life consists in the motion of the fluids and some of the solids of the system, and as the administration of medicine has for its object either some modification, diminution, or increase of this principle; the first thing which naturally presents itself for investigation, is that organ or organs belonging to the animal system in which, is vested the power of exciting to action the muscular fibres, and also receiving sensible impressions from different substances taken into the system; for

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the muscles are the parts which perhaps are alone susceptible of that contractile action or motion giving the principal characteristic to animal existence.

Whether the muscular fibre possesses within itself an inherent power of contracting from the application of a stimulus, or whether this contraction is produced in them by the operation of stimuli through the medium of the nerves, are the two points at issue; the former however which is the theory lately defended by Mr. John Bell is generally received as reasonable and correct — that is, that there exists in the muscles an inherent principle, called by him vis insita, which is an original endowment, independent of the nerves and is the source of motion and animal life. However plausible this theory may appear, from the first view, yet we should not implicitly adopt it, if from a minute examination we discover it in the smallest degree exceptionable and if another in the mean time suggests itself of a more extensive

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application, and a more concordant nature.

That there is a nervous influence originating in the brain and propagated throughout the nervous system, which is the primum mobile or primary cause of all action in the system, and that this may be varied by the operation of different substances received into the system, is the theory which I shall endeavour to establish, to do which, I shall be compelled to take into consideration all the principal subjects which belong to the propositions that I shall advance. As nervous influence appears to be the primary agent in the production of motion, it will not I think be a digression to take a cursory view of its propagation concerning which there has been such a vast variety of conjecture; though the one which most generally prevails, is, that of Dr. Monroe, on which I shall make a few comments, and infer from some primary objections therein the rationality of the one which I shall adopt. The following are the

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outlines of his theory: Viz. "That there is a very subtile fluid secreted in the brain moving in a constant, equal, slow stream from the brain and spinal marrow into each of the proper nervous fibres and that an impression made by the objects of the senses on the very soft pulpy extremities of the nerves of the organs of the senses must make such a stop to the equal flowing nervous fluid, as must instantaneously be perceptible at the origin from which the fibres affected arise; and that the constant flow of the nervous fluid into the cavity of the nervous fibrillae occasion the natural contraction of the muscles by increasing the transverse and shortening the longitudinal diameter of each fibre; and in producing voluntary motion the will has a power of determining a greater quantity of this fluid and with greater velocity into what muscle it pleases." Now in this there appear to me several objectionable points which do not accord with

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philosophical principles; for in the first place that the slightest and most delicate impressions made on the extremities of a nerve capable of exciting sensation, should produce an agitation in the column of nervous fluid, which would be propagated through that extensive mass of sluggish and inactive matter of the nerves and substance, involving them, ~~nerves~~. appears quite contrary to the laws of hydraulics, for the communication of an impulse made on one extremity of a column of fluid is extensive and rapid always in proportion to the elasticity or firmness of the tube containing it, and the degree of force in the impulse given; therefore it is insurmountable that mechanical motion cannot be propagated from the termination of a nerve in the extremities of the body to the brain by so slight an impression made on an organ so little calculated to communicate motion. 2 ly. If the nervous tubes be dilatable (which we would infer from the opinion of Dr. Monro that

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a greater quantity of this nervous fluid can by the action of the will be imbibed through the nerves at some than other times.) even admitting the generation of this nervous fluid in the brain, and its constantly flowing through the nerves to their extremities, we would rationally be led to conclude that by giving an impediment to the passage of the nervous fluid in the extremity of a nerve, the area of the tube containing it, would become increased near the place of compression than counteract the gravity and force of the whole column of fluid. To illustrate this, let us suppose an artery of great length nearly filled with blood, and its position perpendicularly downwards; could we reasonably suppose that a very slight impression made on its lower extremity would propagate motion through the column of blood to the heart in opposition to the force of the blood and its gravity? I promptly answer in the negative

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and as the nerves if they did have tubes and a fluid therein, would be much less calculated for the propagation of motion than the arteries, we may readily discover the impossibility of thus accounting for the propagation of nervous influence, and sensation necessarily dependent thereon. 3ly. And lastly, in the numerous experiments made on the subject there never has been detected a tube in the nerves nor a fluid therein.

After seeing these few insurmountable objections to a theory which I at first felt inclined to adopt, I have thought much on the subject, and a mature consideration of the facts which prove the existence of a nervous influence in every part of the system, even the most remote from the brain; the rapidity with which it is conveyed & put into action by the will; and the momentary production of sensation by an impression on any of the sentient parts of the system, has irresistably led me to the

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conclusion, that in forming an hypothesis embracing all the facts and obviating all the difficulties belonging to the subject, we must reject the idea of any thing like an aqueous fluid and have recourse to one approaching in subtility, rapidity of motion &c. to electricity or galvanism. From all the numerous researches of man into the abstruse and intricate works of nature, it appears there is a veil beyond which the human understanding is incapable of penetrating, and when having arrived at it, hypothesis and analogy are the only pilots to which we can resort, and theories must then be made to bend and meet actual facts. In my speculations, therefore, may I not ask, is it irrational to suppose that an electric or galvanic fluid is generated or accumulated in the brain, pervades the nervous system and is completely subject to the will, and that an impression made on the extremity induces

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sensation by calling into action and thereby abstracting a part of this fluid from the brain? Sensation therefore agreeably to this hypothesis is excited by a loss of this peculiar fluid in the brain instead of its being propelled thereto in greater quantity, and consequently, the greater the irritation or impression on the nerves the more distinct is the sensation produced. In the animal kingdom have we not facts nearly corresponding with this conjecture? The fact indeed is well established that in several kinds of fish, the torpedo, gymnotus electricus, and sylurus electricus, for instance, have the power of generating a fluid very similar to galvanism which is completely subservient to the will, and that it is propelled from its source with a rapidity and violence proportioned to the irritation given by surrounding objects; therefore may not the human species and other animals, (in different degrees) possess a power of generating or accumulating a similar fluid

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which is equally subservient to the will and the production of sensation. It is certainly very manifest that galvanism artificially produced and applied to the principal nerve of a limb exerts an action on the muscular fibres to which it is distributed, similar to that produced by the operation of the will, differing only in degree of violence and regularity. This singular fact, very much corroborates and favours the idea, that the will has a fluid for its agent similar to the galvanic. To extend our views still farther on this intricate subject, let us suppose the will to exist not alone in the brain, but that, that faculty or intelligent principle pervades also the medulla spinalis and that part of the nervous system over which its influence extends though its principal habitation be in the brain. When we discover that its operation or influence is not confined to the brain, but likewise extends to the spinal

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and also to the nerves of the voluntary muscles; and again that the substance of the brain and nerves is perfectly homogeneous, being a continuation of the same thing and have a mutual dependence on each other, the supposition is not futile but on the contrary, carries with it some degree of probability: for the rudement of the mind is solely dependent on the condition of the external senses for the formation of its faculties, and on the other hand the state of the external senses equally dependent on the healthy condition and energy of the brain. Therefore let us suppose either the will to be seated in the brain and has for its agent in the production of muscular motion something like the galvanic fluid; or that it it is not confined alone to the brain but extends also to the nerves of the voluntary muscles, ready to put into action the fluid with which the nerves may

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be supplied, thereby producing the instantaneous contraction of any muscle subject to its control. The nerves over which the will has no command, being small, more insulated, and passing through muscles such as the heart, arteries, &c. whose fibres are more dense, and compact than the voluntary ones we may suppose they afford no residence for the will and consequently they are involuntary in their action. But after all this train of hypothesis concerning the propagation of nervous influence it still remains to us involved in mystery and darkness, though it is sufficient for us to know, that motion excited in any part of the system, is absolutely dependent on the presence of nerves, as it is through their medium alone that muscular action is produced; in what manner they effect this contraction in the muscular fibre by the application of a stimulus to them I shall not pretend to

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This leads us to resume the consideration of Mr. Bell's de
tence of the opinion, that the irritable principle call
ed by him the vis insita is a distinct and inherent
property of the muscular fibre perfectly independent
of the nervous system. That the muscular fibre is ex
citable of contraction is very evident, but that it pos
sesses an intelligent principle within itself, which
induces contraction from the application of stimuli
appears to me very doubtful. 1st Because in the ner
vous system the vis insita exists in no part without
the presence of nerves and it increases or diminishes in
proportion as the excitement of the nervous system is
greater or less, (under certain limits) for when under
the operation of a stimulus the system is both more
irritable and sensible, than when the energy of the
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and nerves is much impaired, as is the case in Baby &c
2 ly. In a muscle paralysed by the division of its prin
cipal nerve, we very evidently see that its sensibility
is not only much destroyed, but its irritability is also
considerably diminished, and the arterial action ex
-ceedingly feeble, which is a correct criterion by which
we may judge of the state of irritability or vis insita of
Mr. Bell, as this action is induced by the application
of the blood to this irritable principle, and consequently
it should always be in proportion to the degree of irrita
-bility and the force of stimulus applied. Now if this
irritable property were an inherent and original endow
-ment of the muscular fibre perfectly independent of
the nerves, in what rational manner could we possibly
account for its diminution, while in other parts of the
system which receive their usual portion of nervous in
-fluence, a natural and ordinary action of the arteries
is

keep up? I see no other than by placing the irritable principle among the properties of nerves. The strongest fact by which Mr. Bell defends his position is, the power which a muscle possesses of being excited to contract by the application of an irritant for a short time after its separation from the system, which I think is by no means irrefragable; for I can just as readily conceive that nervous influence can exist in a part for a short time after its separation from the brain, as that any property of a muscle should remain any length of time after being separated from the general system on which it depends for life. And as to the existence of irritability in the vegetable kingdom we cannot absolutely prove it to be independent of nervous influence of a grade inferior to that of the animal creation, for in some parts of the animal system we have instances of the existence of sensibility, as it were in

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in a latent or dormant state, where nerves can be readily detected, of which the bons tendineuses are examples when in a dormant state; and again some of the inferior orders of the animal kingdom which possess little or no brain have the irritable, irritable, or in grade of sensibility as I shall call it) in a great degree, and yet at the same time they are nearly devoid of common sensibility, which I would ascribe to a great quantity of nerves and very small quantity of brain. Therefore we may assume this for a maxim, that in the animal kingdom sensibility is in no proportion to the quantity of brain and irritability in proportion to the quantity of nerve without brain. These few cursory objections to the theory advocated by Mr. Bell (to which many more other might be added) urge me strongly to the belief that what is termed vis insita is nothing more than a modification of sensibility existing in the nerves of each muscle

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modified agreeably to the density and texture of their fibres and quantity of nerves with which they are enkilled: for instance, we see the arterial-system, the alimentary canal, the lymphatics, &c whose actions are evidently muscular, each possess an irritability or irritation peculiar to itself, being adapted to certain stimuli as the blood, aliment, chyle &c. in producing ordinary and healthy action. Now if this excitability belonged exclusively to the organization of the muscular fibre, in what rational manner could we account for its various modifications in different parts of the system, since it is ascertained ~~as far as~~ as far as observation has gone that every muscular fibrilla is identically the same, notwithstanding their difference in colour and arrangement. To solve this and other difficulties we are compelled to bring in the agency of nervous influence; for if this peculiar property of irritability

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attendant on the combinement principles and certain formation of the minutest muscular fibres themselves, the mere circumstance of arrangement could not have the smallest influence in giving different degrees & modifications of their property. It is my belief that the most plausible and unexceptionable method of surmounting the obstacles with which we meet in Mr. Bell's theory, is, to consider what has been termed irritability of muscles a property belonging to the nervous system, or in them we discover an extensive resource, by which the phenomena above alluded to may be satisfactorily explained: Thus notwithstanding the homogeneous nature of the nerves in every part of the system it is very manifest that they are susceptible of receiving very different degrees of sensibility, varied by certain circumstances, which I am inclined to believe are the different degrees of laxity or density of the parts through which they

haps; rendered more sensible in proportion to the slightness of injury on the nerves by the cellular membrane or muscular fibre which envelope them; or their extensive exposition to the peculiar stimuli to which they are adapted: for example: the different senses as those of vision, hearing, smell, taste, and touch, are all modifications of sensibility belonging exclusively to the nerves; the sense of vision which I conceive to be the most acute of all the senses, being excited by the most subtile of all substances in nature is seated in a nervous pulp, not surrounded or compressed by any matter through which light is incapable of penetrating, and consequently a greater quantity of nervous matter comes in contact with this stimulus, and thereby the sensation excited is rendered more perfect. Again the nerves in which is seated the sense of hearing, are perhaps next in point of sensibility, as approaching nearer the circumstances which I have mentioned as favour sensibility, and so on with the

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of the nerves, in proportion to their approach to these circumstances, for it would be quite absurd to suppose that different nerves originating from the same source the brain, and identically the same in substance, should be endowed each with a peculiar and distinct sensibility, independent of collateral circumstances. Seeing then that the texture of the parts through which nerves pass, and their greater or less proximity to the action of stimuli greatly influence their degree of sensibility we may rationally account for the peculiar sensibility or irritability of the different parts of the system as the heart, arteries, stomach, lymphatics &c. on the same principle, if we admit that the property which has been termed irritability or vis insita is only an inferior degree of sensibility and consequently a property of the nerves. From this I conclude that the action of the involuntary muscles is dependent on nervous influence, and their action is greater or less in proportion to the force of stimulus applied

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the state of the nerves in the different parts. viz. that the different degrees of contraction and involutment of the nerves in the different involuntary muscles, variously modify and affix to them certain degrees of irritability which are peculiarly adapted to their respective stimuli as the blood, aliment chyle &c. which also possessing different degrees of exciting power consequently vibrate as it were with these certain degrees of irritability. The same objections ~~which~~ I made against a probability that the difference in arrangement in the muscular fibres could influence their irritability, if said in the fibre itself, cannot be urged, against the position which I have taken with respect to the nerves, because they are dependent on an influx of nervous fluid from the brain for their sensibility and this influx may be variously modified by the circumstances which have been already premised. Whereas on the contrary, if this principle of irritability resides in the muscular fibre and

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on its organization alone, difference in arrangement, could not exercise the same influence on its irritability.

From all the preceding observations I infer that what has been termed irritability, and sensibility, are both properties of nerves; sensibility being a more perfect, and irritability, a much lower degree of that excitable principle with which the nerves are endowed; that the muscular fibre possesses no independent intelligent principle which prompts it to act agreeably to the force of stimuli, but it is excited to action by and through the medium of the nerves and in proportion to their degree of excitement by the application of stimuli, just in the same ratio does muscular action increase, and that they only possess the susceptibility of contraction which is acted on by the nervous influence. Thus the stimulus of the blood produces action in the heart and arteries; this action however is not excited immediately operating on the muscular fibre but by first exciting

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the nerves expanded on their internal surface and by that means being into action the muscular fibres, which is varied by the quantity and stimulant quality of the blood and the excitability of the nerves of the part; hence I infer that the nerves constitute the proximate cause of all motion, propagated in the system, either by some chemical action or by serving as a conductor to some subtile agent which may produce thus constringing or contractile effect on the muscles; however if this nervous influence has not the direct effect of contracting them we ~~may~~ may safely and confidently conclude that the natural and healthy action of the involuntary muscles is absolutely dependent on the presence and influence of some principle of the nerves which principle, is transmitted in quantity greater or less in proportion to the excitement produced in them by the application of stimuli. And again, that the natural action of some of the involuntary muscles, the arteries for instance, depend more

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the greater quantity of natural stimulus, for their constant and vigorous action than their superior degree of excitability; for many other parts of equal and perhaps superior excitability are quite quiescent for want of an exciting power constantly acting; thus as has been before observed where a limb has been paralysed by the division or compression of its principal nerve, rendered nearly insensible, and the power of voluntary motion destroyed, still arterial action is feebly carried on, which is effected by the constant operation of so great a quantity of stimulus, the blood; hence if the irritability of the voluntary muscles and arteries were precisely the same we could rationally account for the action of the one and quiescent state of the other, when we attend to the circumstances, of the latter having a quantity of stimulus operating on them, and on the contrary the former being destitute of a constantly exciting power; and hence also I infer that in fever when the muscular system is languid and

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and much debilitated from some diminution of nervous energy we may in like manner perceive the cause of preternaturally high arterial action; viz. because a strong exciting power is incessantly operating, and that directly on the internal parietes of the arteries whose excitability is evidently during fever increased either in some peculiar manner or else the blood must acquire some additional stimulant quality, or perhaps both may in a certain degree take place, the former I think by a translation of nervous influence from the nerves of the muscles to those of the arteries thereby increasing their excitability; which translation may be thus produced: It is very obvious that an exciting power or instant when applied to a sensible surface so as to produce increased action, must necessarily be an exhaustion of excitability or the excitable principle of that surface during the continuance of this action, which thereby occasions a constant and steady determination of this principle from the neighbouring or circumjacent

[illegible] to [illegible] in a manner similar to the rushing in of the circumambient air to a fire where in there is a vast consumption of air, and of course a tendency to a vacuum. Again a plaster of flies or any other irritant when applied to a part of the body or manifesting increases the irritability, and thereby excites a more vigorous action in that part, which is effected by first causing its irritability, and increased action necessarily ensues, the exhaustion being then in proportion to the action thus produced, the excitable principle or nervous influence of the neighbouring parts, is determined to it as a more free and ready outlet; by that means preternatural sensibility and irritability is accumulated, and from it I infer that the excitability of the arterial system is accumulated on the same principles in fever: there it has been long established, that any cause producing fever, first occasions langor and debility which I conceive is accomplished by diminishing

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energy, the muscular system being subordinate is of course rendered weak and quiescent, and consequently the exhaustion of irritability by ordinary exercise is suspended; though the blood notwithstanding constantly acting on the arterial system with perhaps increased force, the action and consequent exhaustion thereby produced, then serves as the only wheel is the constant though diminished flow of nervous influence, from the brain, and the consequence of which is, that the nervous influence of the muscular system is concentrated, and accumulated, in the arterial system, and that preternatural action constituting fever naturally ensues. Fever thus excited, appears primarily to affect the the arterial system, because when in any manner disordered, it is more promptly and obviously made known to the physician, for their action is always subject to the senses and observation; but as they are always subordinate in their action to the state and influence of the nervous system,

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must have it to its origin there, in which the primum mobile of the animal oeconomy exists.

Having established I hope the rationality, that sensibility and irritability of the animal system are only modifications of the same thing, and resides in the nerves, and also that nervous influence is the proximate cause of all the motion propagated in the living fibres, I conceive that the corner stone of my fabric is laid down, because they are the principles alone, on, and through which, medicines exert their influence, and produce increased, or diminished action in the animal system; in short the whole amounts to this, that all medicines act on the system through the medium of the nerves.

It only remains for me now to consider, in what manner, different substances taken into the stomach excite and propagate, some a greater quantity of nervous energy to particular part, and others equally to the whole system.

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Before I enter on the subject, the consideration of several sensations in the animal oeconomy naturally directs it - self to me, particularly the susceptibility of the medullary matter or nervous pulp to receive an impression from the contact of different substances and its power of communicating it to the brain and the whole nervous system. This is a subject dark and I fear unfathomable even to future investigations, though no difficulty in philosophy should cramp our speculations or damp the ardour to arrive at the acme, of perfection in our sciences; under these considerations I am therefore urged on to some speculations on the subject. The animal system, as in some other parts of the great fabric of nature is composed of many various parts, all of which contain many different elementary principles, and the certain fixed proportions of only a few, this may constitute the principal or only difference in most of the substances in nature, which exhibits so great a variety

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of appearances. And notwithstanding the wonderful variety observable in the texture of the animal organs we find that the vast number of compounds are reducible by the chemist to a few elementary substances. The medullary matter of the brain and nerves, the muscles, bones, tendons, ligaments, glands, &c. though so different in texture and properties are originally derived from the same source the blood; which nevertheless it is formed of so many articles of diet in different animals and the same animals at different times, appears, always capable of furnishing by secretion a certain set of ingredients necessary for the formation of the fixed stamina of the system; hence I am disposed to think, that among the great variety of matter in creation there are but few simple elementary principles composing them, and the many compounds differ only in their proportions of these fundamental principles. But it is a thing exceedingly mysterious how such a variety of compounds are formed in the

system

from an apparently homogeneous mass, the blood, and equally mysterious ~~as conceive~~ to conceive, how the blood itself can be formed from such an infinite variety of substances taken into the stomach and still always ~~contain~~ certain component parts for the renovation of the system. To form a rational conjecture on these subjects, we are compelled to resort to aid from the operations of chemistry, or else give to each of the organs of the animal oeconomy a certain intelligent principle which enables it to select from the variety of component principles of the blood, those adapted to its nature, and texture, which would be quite visionary and absurd. The former I think carries with it fewest objections, and enables us more satisfactorily to account for various phenomena of the animal oeconomy; for in the process of nutrition, I think it not an irrational conclusion, that chemical and corpuscular affinities have very considerable agencies; it would indeed be

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unphilosophical to imagine that animal matter was perfectly destitute of all those properties which would subject it to the laws which nature has established between different species of inorganized matter; therefore I can readily conceive that the different component parts of the system, for instance the muscles, bones, tendons, &c whose constituent parts remain immutably the same though constantly undergoing decomposition or absorption and again recomposed from the blood, may have respect to several of the laws of inorganized matter particularly those of affinity; by which the several parts may attract and combine with those minute particles of the blood, whose nature is homogeneous with them, and thereby carry on a constant innovation or nutrition in the different parts of the system. As to the reduction of the different kinds of food taken into the stomach to that state in which they are subservient to the assimilation into the blood, I conceive it likewise

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to be a chemical process, for among the great variety of the articles of diet, in civilized life, nearly the whole of them may be traced primitively to a vegetable origin, and I may perhaps with safety assert, that none of them serve the purpose of nutrition in their actual state of combination; therefore we would naturally contemplate, a complete disorganization of the substances taken into the stomach, before their conversion into chyle, and consequently when in that state. It is reasonable that they are reduced only into a few compounds or simple substances, which enter into the mass of blood and are abstracted from it by the several parts of the system according to their different elective attractions. Thus bringing in the agency of chemistry, we may make it serve our purpose also in accounting for that supply of nervous matter by the blood, which is essential to keep the brain and nervous system in a state susceptible of impressions by the natural and

artificial stimuli on which depend the action and health of the system. For we discover that they, as well as the other parts of the animal-economy are equally dependent on the blood for invigoration, especially when by any means nervous energy is impaired. Therefore considering the nerves and brain to be the primum mobile of the system, that they are the first which receive an impulse and the only parts to transmit it to the moving fibres, it is of our importance to know their dependence on the blood, for that state essential to the conveyance of its proper influence and its consequent susceptibility of disorder through that medium; I conceive as before said of the other parts of the system that they likewise possess an inherent power of affinity for matter of a homogeneous nature, by which they select from the blood that part which serves the purpose of regenerating their loss of substance and increasing their power of conducting

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if we or as I have supposed the animal electricity. We may rationally suppose that there is a certain condition of the nerves in which health consists, and when it exists they only admit of such a propagation of nervous influence, to the different parts of the system as to enable them to perform their natural and ordinary functions; and this condition of the nervous system, I say, is no doubt dependent in part on the quality of the food taken into the stomach, as by those articles of diet which we term cordial or stimulating it is rendered much more excitable and when on the contrary we make use of a bland article of diet void of this stimulating quality for any length of time the excitement of the system is considerably reduced; when therefore any substance which we term stimulating is taken into the stomach, this stimulating principle is attracted and combines with the nerves of the internal surface of the stomach, and the

tendency to an equilibrium in the nervous system, or the power of sympathy communicates the same disposition or impulse thereby produced, throughout the whole system, but more immediately to those, and, with which the stomach has the most intimate and extensive nervous sympathy or communication. It is thus I account for the impulse or impression produced on the nerves and brain and its communication to the other parts of the system producing increased excitability and sensibility. Having premised these general principles I shall now draw the inferences deducible therefrom, and apply them to the subject under consideration.

In the administration of medicines I conceive there to be only two general indications and these are to stimulate or depress; in what manner these two objects are effected, it remains for me yet to illustrate; and in doing which, I shall have frequent occasion to refer to the foregoing

principles. I will commence by again repeating, that the action or influence of medicines on the system is produced by primarily operating on the nerves and prompting them to excite action in the living fibres, and as they are distributed to every part belonging to the human body, the hair nails, and cuticle excepted, I conceive that they are the parts alone, which are out of the ~~influ~~ sphere of nervous influence and necessarily the immediate operation of medicine; but I wish it to be understood that every individual part of the system to which nerves are distributed, does not possess the same degree of excitability, but as before observed it is modified equably to the quantity of nerves, and their exposition to the operation of their appropriate stimuli which is varied by the texture of the part through which nerves pass: for instance, the heart and arteries, the muscles, the stomach and intestines, the lacteals and lymphatics, the

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bones be possess different degrees of nervous influence according to the above circumstances, what very much corroborates, and indeed reduces to actual certainty the position which I have before taken, that is, that the texture of a part gives to it, its degree of irritability, is, the well known fact that the bones and tendons though not possessing the smallest degree of sensibility in their sound state are undeniably sensible, by an alteration of their texture by inflammation. Receiving this as correct then, we may readily account for the visible difference in the operation of many medicines on the several parts of the system, though before undertaking this, I will first inquire into the method by which medicines are brought into actual contact with the nerves so as to produce their effects. It appears evident to me that all medicines taken into the stomach with a view to a general or local operation, produce excitement in

the whole or a part of the system either by acting immediately on the nerves of the stomach, or other surfaces to which they are applied, and through them on the brain and whole nervous system, or else they act through the medium of the blood, on the excitability of the different parts according to their force. With medicines as it is with most of the articles of diet they almost invariably suffer decomposition by the process of digestion, and it is probable that very few act when in their state of combination, but only furnish after decomposition some principle which excites the nerves to exercise their influence. Seeing then that medicines come in contact with, and act on the nerves only through the channels just mentioned, we can without difficulty trace them in their operation on the system both when they act generally and also when they are said to act locally; thus, we are well aware that the stomach and intestines, blood vessels, absorbents &c.

all

possess certain degrees of excitability, sui generis, and also, that each of them has certain appropriate stimuli destined to them, which produce their ordinary action by operating on their excitable principle; it is evident then that when the brain and nervous system are excited by the operation of medicines through the medium of the nerves of the stomach, all the different parts of the system share a part in this excitement in proportion to their usual quantity of nervous influence, that is, the excitability or susceptibility of action in the different parts is more or less according to the degree of nervous influence commonly received by them; therefore to estimate the degree of internal action thus induced in different parts we should consider the probable force of their natural stimuli together with their increased excitability: for example we might say the ordinary stimulus of the blood to be 10 the ordinary excitability of

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of the bloodvessels to be 8 these two numbers multiplied we will say indicates the force of natural action which is ·50·, but if there be an increase of 8 degrees of excitability, this would produce an action many degrees higher than health; (that is 100) thus by comparing the degrees of excitability supposed to be natural to each part also their appropriate stimuli we may readily account for the greater action produced in some than other parts by medicines exciting the nerves and thereby imparting an increase of excitability, which, I have considered as a property belonging to them. On the contrary when a stimulus acts on the system through the medium of the blood it must necessarily be taken into every part to which the blood is distributed, but its operation is evident only in particular parts unless its power be very great, for the different parts belonging to the system, being possessed of very different degrees of excitability if a feeble stimulus is taken in, it might

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less than the natural stimulus of some parts, and greater than others, and consequently its operation sensible only in those parts whose ordinary stimuli were inferior to it; to illustrate this we will say that the ordinary or natural stimulus of the intestines is 5, bloodvessels 10 and lymphatics 7, well, if a medicine is taken into the mass of blood which is distributed to each of those parts, its stimulant power being 6, it is very evident that it would produce no sensible effect on the bloodvessels or lymphatics, being inferior, but being superior in power to the natural stimulus of the intestines, it would produce preternatural excitement therein, and hence those medicines which act in this manner have been termed local stimulants as the classes of purgatives, diuretics, &c. From this I conclude that those medicines which act as general stimulants must surpass in power, the natural stimuli of all the different parts of the system; for

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for exhausting the natural stimulus of the blood to be the greatest of any the individual systems, if a stimulus exceeds it in power the whole will be necessarily affected. As all the parts belonging to the system capable of motion are supplied with fluids which derive their origin from the blood, of course they are all manifestly subject to the operation of medicines with which the blood is impregnated if, agreeably to the preceding observations the stimulant power of medicines is greater than the fluids with which they are constantly supplied, for instance, if a part has been long habituated to a certain stimulus its removal and the application of one of inferior power would diminish instead of increase the action of the part, and although it might act as a stimulant to some other parts, yet it might to that part be considered a sedative.

By these observations I do not wish to imply that all medicines which act locally, is effected through the medium of

the blood, but that in many instances they do operate in different parts in this way, for it appears very probable that every individual part whose texture and property is different, receives certain appropriate parts of the blood, for its nutrition, which keeps up certain specific actions in them; it is very obvious then that if the blood were impregnated with any stimulant it would vibrate as it were with the irritability of some one of the part, to which it is distributed and excite preternatural action therein; it is thus I account for the local action of some medicines when taken into the circulation as those which we term diuretics, emmenagogues &c. I am acquainted with no physiological principles which can justify an opinion, that certain substances taken into the circulation can be determined to any particular part of the system, and entirely excluded from every other, but consider that whatever is taken into the circulation of the blood, is

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to all parts of the system in proportion to the quantity of blood they receive. In this manner likewise, I can imagine that the action of the different secretory organs may be considerably influenced, for it is quite rational to suppose that every gland in the system whose function it is to secrete a peculiar fluid, must necessarily have a peculiar structure, which gives to its nerves a degree of irritability sui generis, and consequently, that specific action is propagated to its bloodvessels which is alone capable of separating from the blood its particular secretion; thus for example, we may say the liver has a structure different from all the other glands of the body, and of course gives to the nerves of that part a certain degree of irritability, which is alone capable of producing that specific action, essential to the secretion of the bile; the same supposition will equally apply to all the secretory glands of the system, for it would be

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very irrational to suppose that the blood is not merely the same throughout the arterial system, and contains the component principles of the bile in the liver and destitute of them in all the other parts of the body; or equally irrational to suppose that secretion is a mechanical process, and that the difference in structure in different glands enables them to filtrate from the blood their particular secretion. Again we perceive that the process of secretion is not confined to a glandular structure, but that it may be carried on in any of the soft parts of the body, by exciting a certain degree of inflammation, as it is well established that pus is a secretion produced by inflammation, which fact serves to corroborate the above belief, that a specific action is necessary for the production of every different secretion, and that this action depends on the peculiar irritability of the parts; and like the other parts of the system the action of the glands may be internally increased by

certain stimuli which vibrate with their different degrees of irritability.

I will now conclude with only a few remarks on the operation of the minister classes of medicines, and as the sensible operation of all is effected by exciting a more vigorous nervous influence, either generally, or locally, we may with propriety term every medicine which produces a sensible effect on any part of the system, a stimulant, according to the following definition of that term. By stimulant, I understand those medicines, which when taken into the system, excite increased energy in some part or in the whole of the nervous system and brain, and consequently an inordinate or increased action in the moving fibres of some part or the whole of the system. But, as medicines possess very different degrees of stimulating power, a subdivision into different classes according to their relative operations, has always been deemed necessary, by the

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the different writers on the subject of the Materia Medi-ca. I shall commence with remarks on the operation of that class of general stimulants which is greatest in power - and then in a very cursory manner, proceed to a few observations on one or two others whose actions are both general and local, by which my ideas in the preceding part may be more clearly illustrated.

The class termed stimulantia or the diffusible stimulants, which is the most powerful, speedy and transient in their operations in the human system, and to which, opium, ether, camphor &c. belong, may I think, properly comprehend the two classes termed by Mr. Murray narcotics and antispasmodics, because the narcotic and antispasmodic effects are only accompanying symptoms of the power-ful action of the diffusible stimulants, and each of the articles arranged under these classes, produce more or less of these general effects, according to their greater or less power.

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All the medicines therefore which I should include under the general class of diffusible stimulants, I conceive to act in a similar manner and only differ in degree of power, that is, they act primarily on the nerves of the stomach, and the effect is communicated to the brain and thence propagated throughout the whole system; and every part subject to nervous influence shares a part in the effects of these medicines, in proportion to the degree of excitability belonging to the several parts, which is varied by circumstances before observed. The manner in which an impulse is given to the nervous system by different substances taken into the stomach, has been suggested in a preceding part, and I can form an idea, of no other more rational though visionary; that is to say, the nervous pulp possesses some chemical affinity for certain principles belonging to different substances, with which when it is combined, it serves as a better

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to that nervous fluid which excites the muscular fibres to motion. That this stimulating matter, which thus affects the nerves is identically the same in every substance which we term stimulants; I contend is not the case, because a medicine of only moderately stimulating power (a tonic for instance) cannot be given in a dose sufficiently great to produce the same effect which is occasioned by a diffusible stimulant given in only a small quantity; and I suspect one certain matter could not be so diffused by different substances as to produce such a variety of effects, but that in the different stimulants, there are contained, certain peculiar principles for which the nerves have an affinity, and which produce effects very similar but only different in degree; and in like manner do the whole of those which we have termed diffusible stimulants possess certain degrees of power, for we cannot produce precisely the same effect from the administration of any two

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of them, regulate the dose in what manner we please, but their degrees of power approach so near each other that we may very well arrange them under one general class. The effects of these medicines extend generally throughout the system and is so speedy that we may suppose an immediate combination to take place between them and the nerves of the stomach, and thence propagate it to the brain and rest of the system; there appears to be a point of saturation between every stimulant and the nerves, that is, after receiving a certain quantity no further combination is effected and at which its maximum effects are produced; but in the mean time the action or combination of one of superior power is not prevented, for after the system has received all the energy which one stimulus can afford still it is susceptible of very considerable effects from one of superior power. Many of the diffusible stimulants apparently have a directly sedative effect when administered

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in large doses, which is occasioned by the very quick satura-tion of the nerves with that principle which promotes the propagation of nervous influence, and produces evi-dent excitement until it arrives at that point of satu-ration by which this communication of nervous influence is retarded, and consequently the powers of the system thereby much destroyed, producing what has been termed indirect debility. Thus, opium taken in a moderate dose gives energy to every function of the body, and mind, but if given in a large dose, the action of the whole system is di-minished in so short a time that there appears to be no previous excitement, because the nerves and brain have re-ceived this stimulating matter to the point of saturation, which in a great measure destroys nervous influence and brings on indirect debility, and all the peculiar symptoms dependent thereon. The point of saturation with the different medicines of this class is not the same, but they occasion-

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diminished action and the many peculiar symptoms which result therefrom, more or less according to their greater or less affinity and combination with the nerves. These are the general principles on which they act, and as to the peculiar symptoms accompanying the operation of each of the medicines belonging to this class, I shall pass over them as inexplicable.

The class of tonics next in consideration which also act generally on the system, is far inferior in point of stimulating power to the former class though they are more slow and permanent in their operation. The operation of this class of medicines is I conceive effected in a manner similar to the former, that is, principally on the nerves of the stomach and through that medium saturating the nervous system with their stimulating principle; nevertheless I am inclined to the belief, that the blood may also be impregnated with the same principle, but this notwithstanding would not increase

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their effects on the system; for the nerves being saturated with the stimulating substance, the application of the same through the blood would effect no farther combination. The stimulating power of the principal articles belonging to this class, surpassing the greatest natural stimulant of any the individual parts of the system, their effects must necessarily extend to all, in proportion to the nervous communication of the several parts; and as their operation is slow, and they do not suddenly elevate the excitement of the system far above the healthy standard, of course the fall from that state of excitement is slow and almost imperceptible; not like the strong diffusible stimulants; do they almost instantaneously elevate the system many degrees above par and give room for a sudden and very perceptible fall.

I come now to consider the operation of one of those classes

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of medicines whose action is local, the class of purgatives for instance, which may suffice for the rest. The sensible operation of this class of medicines is confined, primitually, to the intestinal canal, though I do not suppose that they are determined alone to that part, but that some of them, particularly some of the drastic purgatives, are taken into the circulation and conveyed to every other part by the blood; though being inferior in force to the natural stimulants of many parts, their effects are only visible in such as are supplied with a more feeble natural stimulus; for instance, being superior to that part of the blood which the intestines constantly receive, and sometimes also to other parts, (as the kidneys) whose degree of irritability is nearly the same with the intestines, they excite preternatural action therein, and consequently quicken or increase the action of those parts, producing purging, diuresis, &c. Almost every medicine

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is taken into the stomach and exerts an action on any part of the system, is I believe in part received into the circulation, and as it is probable they are all decomposed before entering into the circulation we should not expect to detect them in the blood in their state of combination: hence I conclude that the presence of a medicine in the blood in an undecomposed state, should not be the only criterion by which we are to judge whether or not it enters into the circulating mass, because its active principle may be received in a separate state, It is not my opinion that purgatives produce their effects by only acting as an irritant to the inner surface of the intestines, but some of them enter into the circulating mass and increase the irritability of the intestines, through that medium, thereby rendering the susceptibility of action by the excrementitious matter much greater; and as purging

frequently depends on an increased peristaltic motion of the intestines, we may rationally enthrone that these medicines operate through the same medium in which the natural stimulus does, which excites this action; and I conceive that the muscular fibres of the intestines are prompted to act not alone by excrementitious matter carried through them, but by some part of the bloode, serving for their nourishment and natural stimulus, constituting received, which excites the nerves and through them produces action in the muscular fibres; it is obvious then that the active matter of the purgatives may be blended and conveyed along with the natural stimulus of the intestines and thereby increase their peristaltic motion to that point which produces purging. I will conclude this subject by observing that a certain specific action in the intestines is necessary to induce purging, hence we may very readily explain why a certain kind of stimulus is required

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such as that exerted by those medicines which we term purgatives, and why those superior in power fail to produce that effect.

The influence of habit on the animal system is a fact so well established, that it would be unnecessary for me to endeavour to furnish one corroborating argument in its favour, but I will only observe that the difference in the predispositions of different people, occasioned by climate, occupation, and diet, renders the operation of medicines so variable that we can affix to them no uniform effect in different people, nor the same person at different times, but they generally tend to produce similar effects which are varied only in degree.

I might go on and expatiate to considerable length on the operation of each individual class of medicines by applying the general principles which I have

advanced

advanced, to each of them, but as my time is narrowly limited and I may be readily anticipated on the operation of the other local stimulants, I will conclude with a request to the faculty to excuse the free range which I have given to my imagination, and also that ~~[illegible]~~ want of connection, exhibited in this composition, which is always the offspring of great haste.